Ferroelasticity and Hysteresis in Mixed Conducting Perovskites

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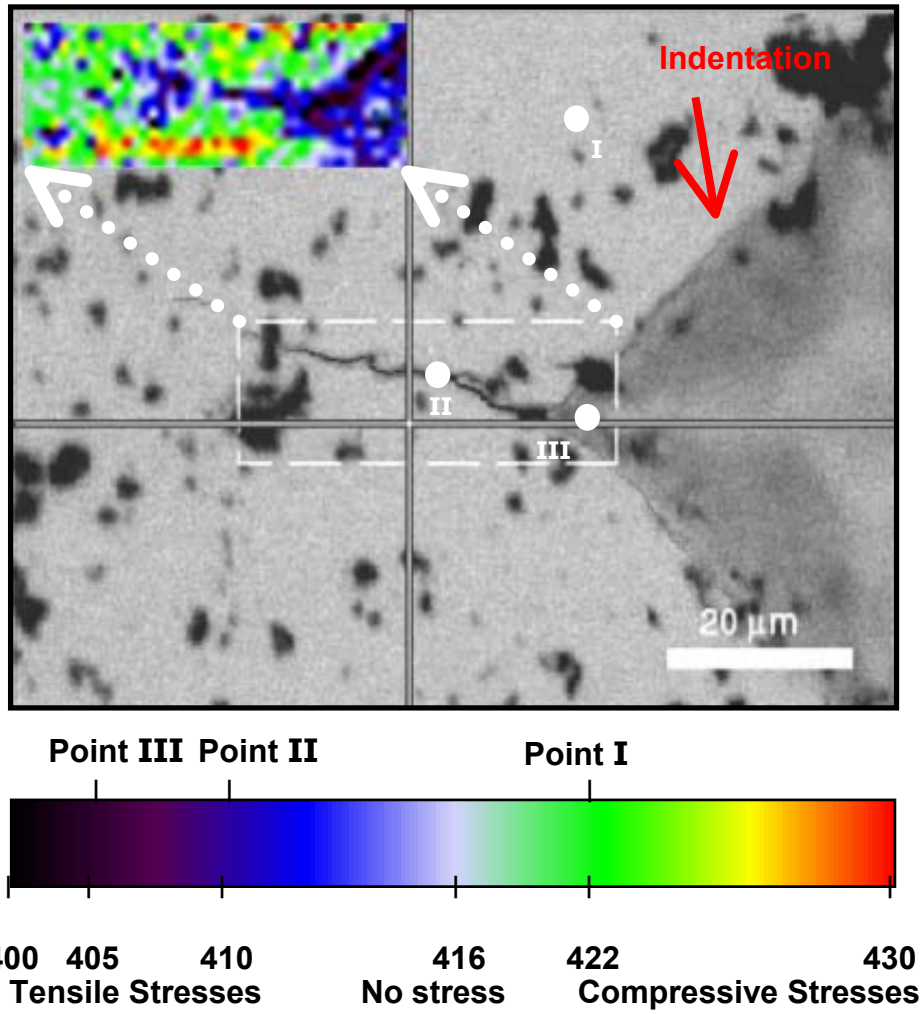
DMR-0201770

Mixed ionic electronic conducting perovskites are important materials for solid oxide fuel cells, oxygen separation membranes, sensors, and catalysts. The improved reliability and mechanical stability of the materials are required and, therefore, the knowledge of a sign and values of stresses is important for design and operation of these advanced energy systems. Here we present the 2D picture of a stress distribution in $LaCoO_3$ perovskite after Vickers indentation measured by micro-Raman spectroscopy. An area mapping of the residual stresses was done by a curve fitting of 416cm^{-1} Raman band position taken from the selected area of the interest. The 2D Raman image shows the existence of tensile residual stresses along the crack generated from the corner of Vickers impression.



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Education:

Two undergraduate students (Anthony Coratolo, GPA-3.98, David Steinmetz, GPA-4.00) and one graduate student (Sidhartha Pathak) contributed to this work. David Steinmetz is a recipient of an Independence Chapter of the Association of Old Crows Scholarship. He also decided to get BS/MS degree working on mechanical properties of MIEC perovskites. Anthony Coratolo's poster "Self assembled dendritic structure of perovskite $LaCrO_3$ thin film" presented at the American Ceramic Society meeting in April 2003 won a second place in the undergraduate category. A high school student Cameron Arshad worked in the PI's lab during the summer time.

Outreach:

PI and Co-PI were directors of an international NATO Workshop "Mixed Ionic Electronic Conducting Perovskites for Advanced Energy Systems" that was held in Kiev, Ukraine on June 1-5, 2003. 50 participants from 11 countries participated in the meeting. Both graduate and undergraduate students participated in the organization and editing of the Workshop proceedings.

NSF Workshop "Ionic, Electronic, and Mixed Conducting Ceramics for Advanced Energy Systems" is planned to be held in March 11-12, 2004. A number of graduate and undergraduate students, young scientists, minority and scientists with disabilities will get a support to attend the Workshop.